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Ahmad

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(54) **REMOTE MONITORING AND CONTROL OF LED BASED STREET LIGHTS**

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G05B 23/02 (2006.01)
G05B 11/01 (2006.01)

(52) **U.S. Cl.**
USPC **340/10.1**; 315/312; 340/3.1; 700/19

(58) **Field of Classification Search**
USPC 40/557; 315/312; 362/311.02, 240, 85; 340/10.1–10.52, 310.11, 635, 815.45, 340/906–907, 909, 915, 917, 924, 944, 3.1; 700/17, 19
See application file for complete search history.

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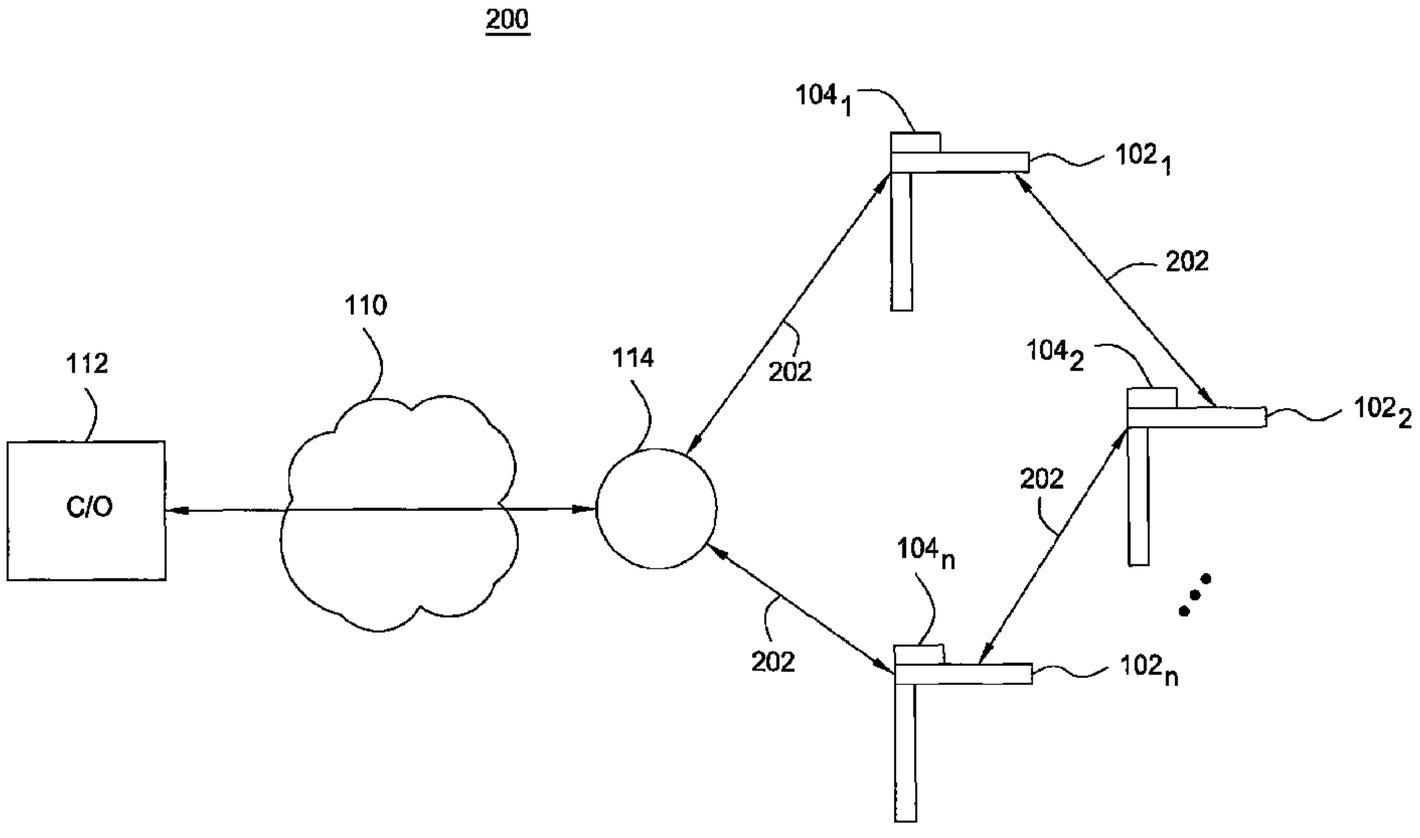
(57) **ABSTRACT**

The present invention is directed to a method for remotely monitoring and controlling a light emitting diode. In one embodiment, the method includes establishing a two-way communication path via a communication module to a central office, wherein said communication module is coupled to said LED based street light and sending information related to the LED based street light to the central office via the two-way communication path.

17 Claims, 7 Drawing Sheets



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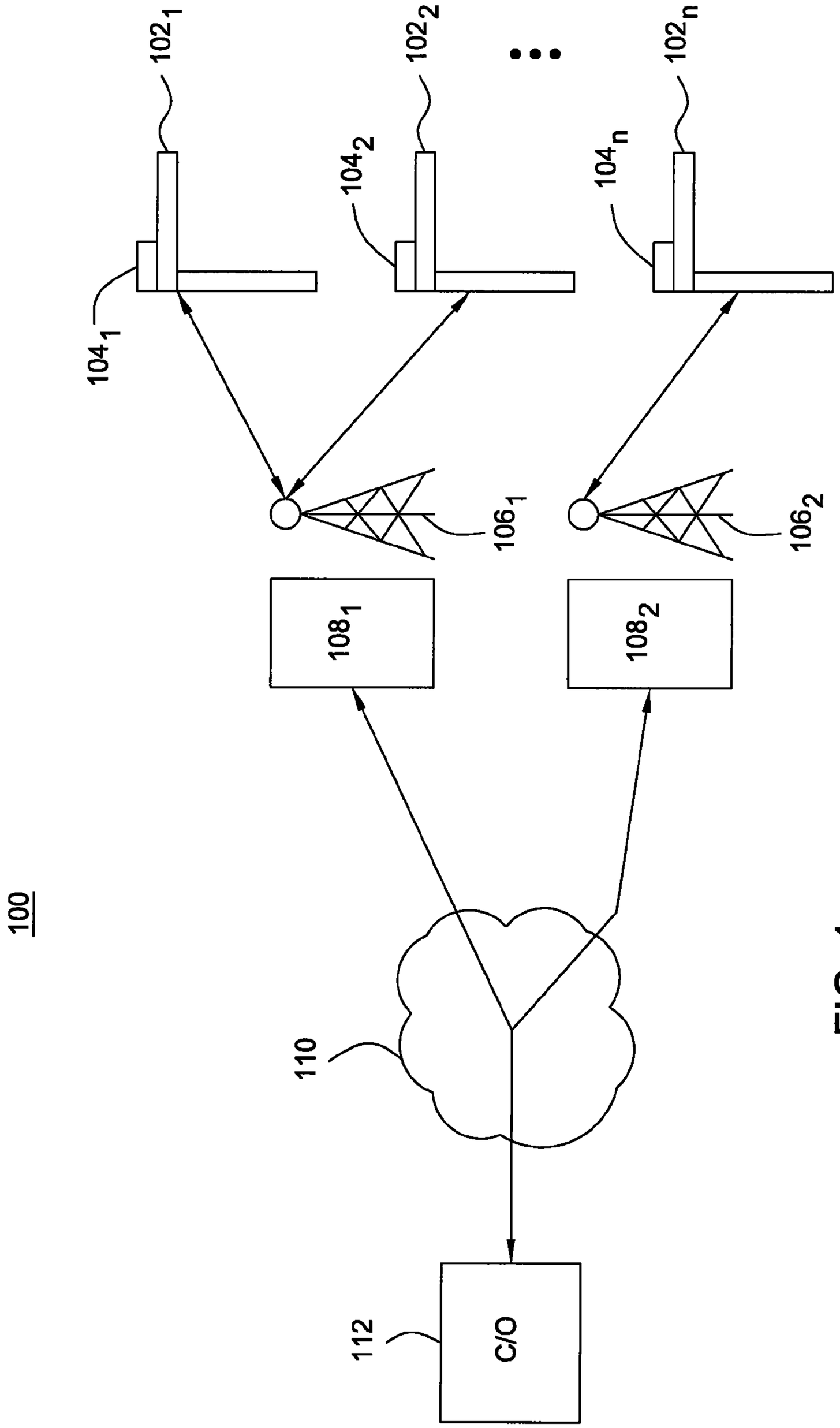
100
102_1
102_2
102_n
104_1
104_2
104_n
106_1
106_2
108_1
108_2
110
112
C/O

FIG. 1

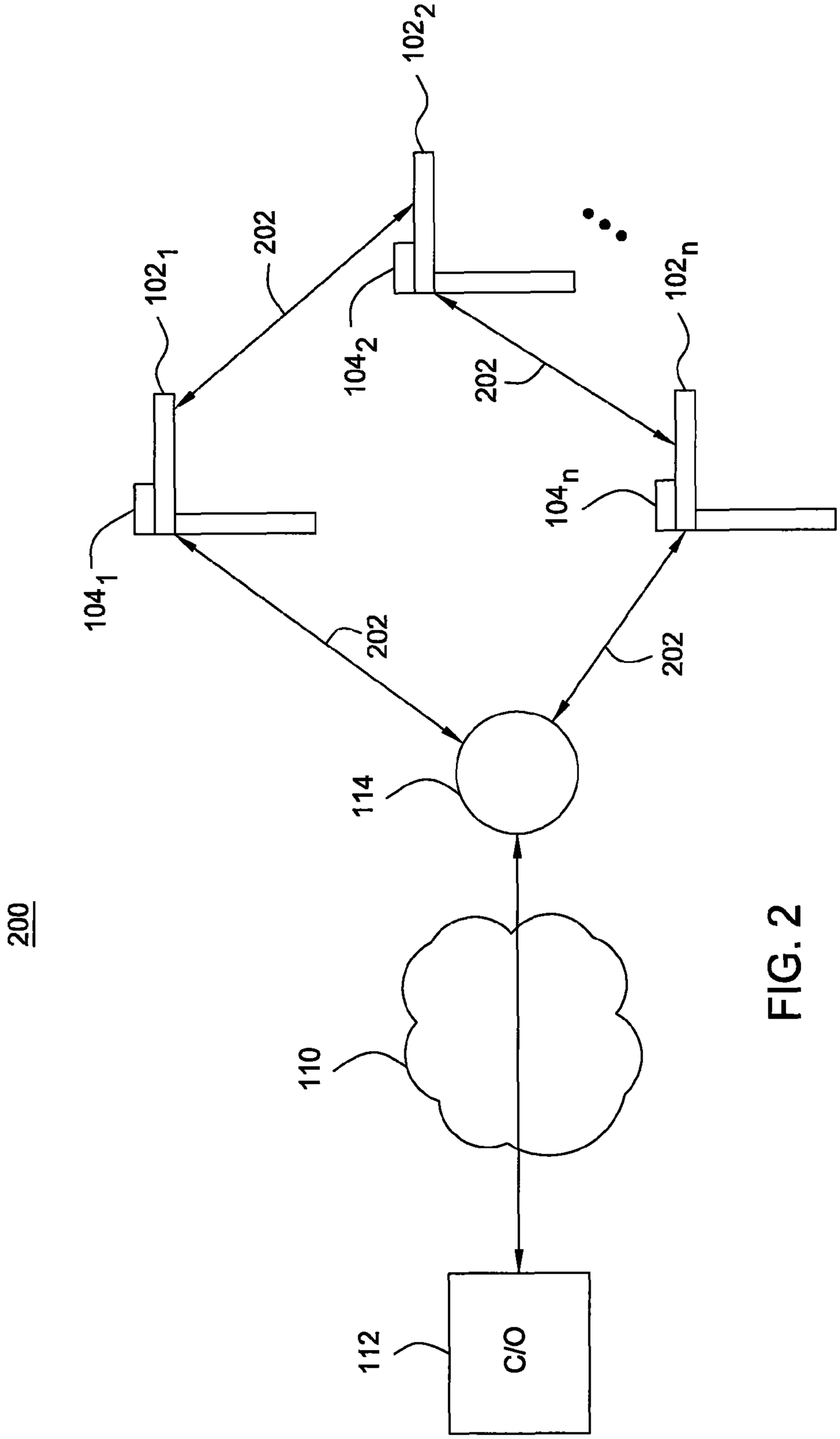
200
102_1
202
102_2
104_2
202
102_n
104_1
104_n
202
202
114
110
112
C/O

FIG. 2

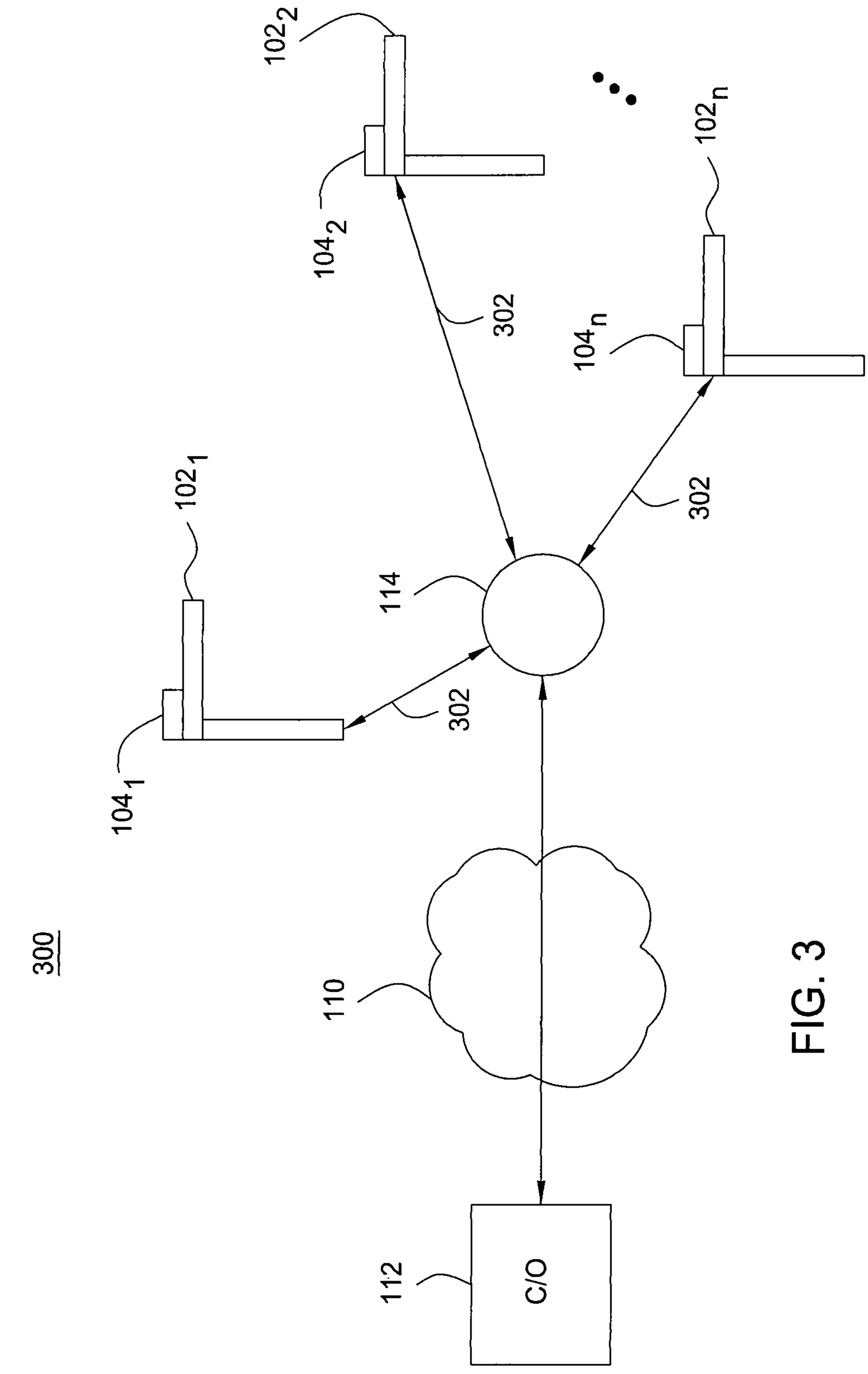

FIG. 3

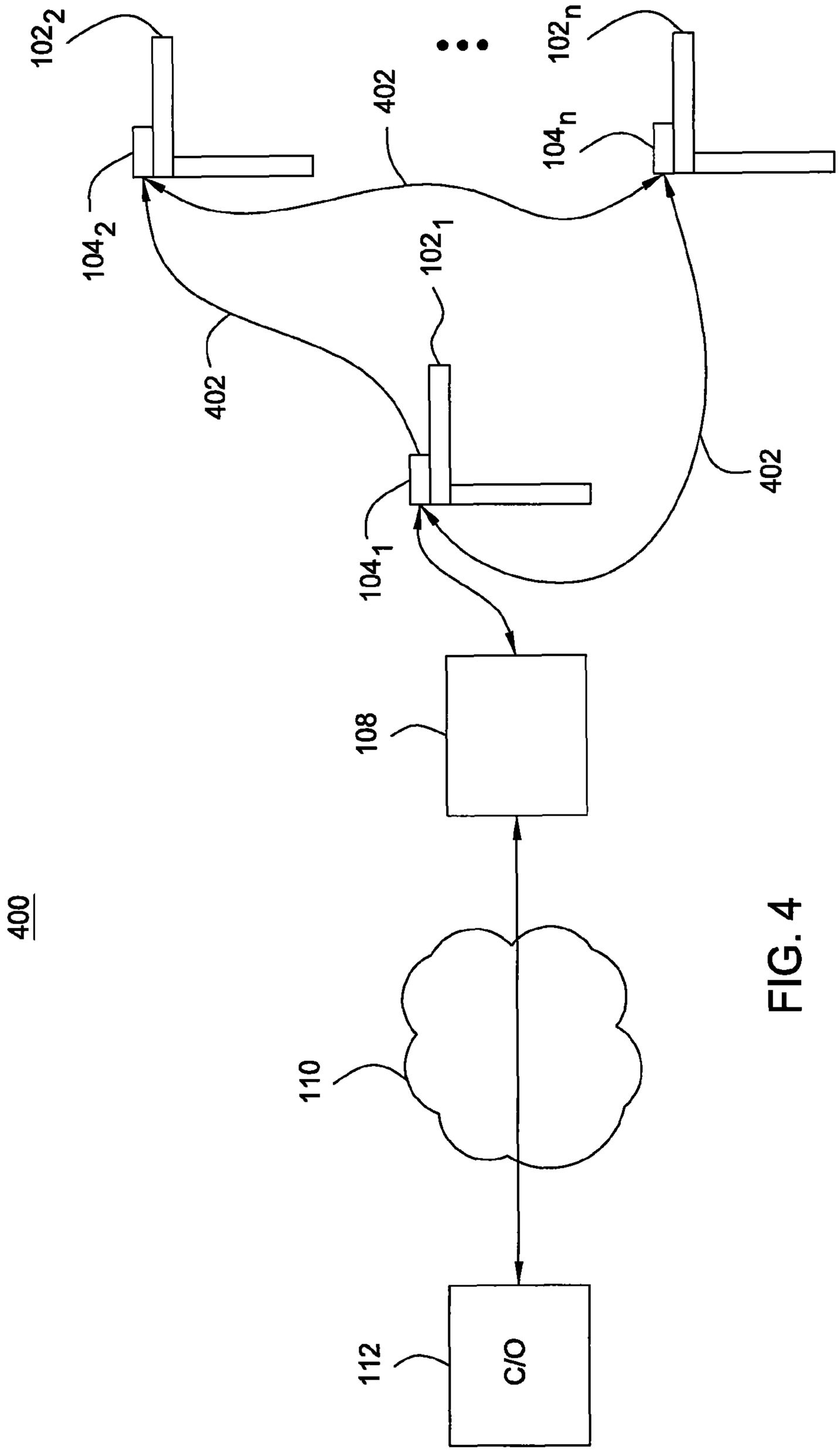

FIG. 4

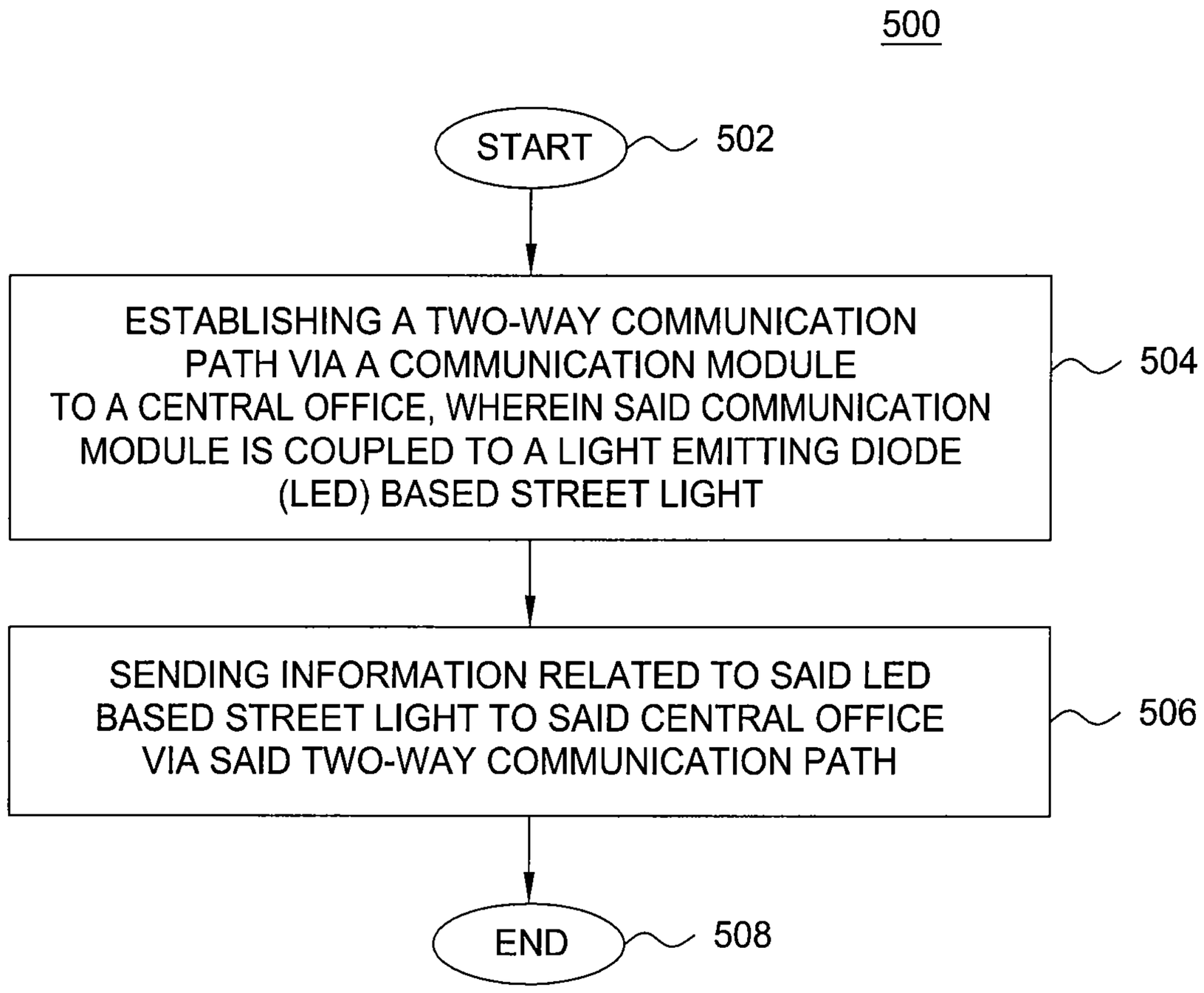
500
START
502
ESTABLISHING A TWO-WAY COMMUNICATION PATH VIA A COMMUNICATION MODULE TO A CENTRAL OFFICE, WHEREIN SAID COMMUNICATION MODULE IS COUPLED TO A LIGHT EMITTING DIODE (LED) BASED STREET LIGHT
504
SENDING INFORMATION RELATED TO SAID LED BASED STREET LIGHT TO SAID CENTRAL OFFICE VIA SAID TWO-WAY COMMUNICATION PATH
506
END
508

FIG. 5

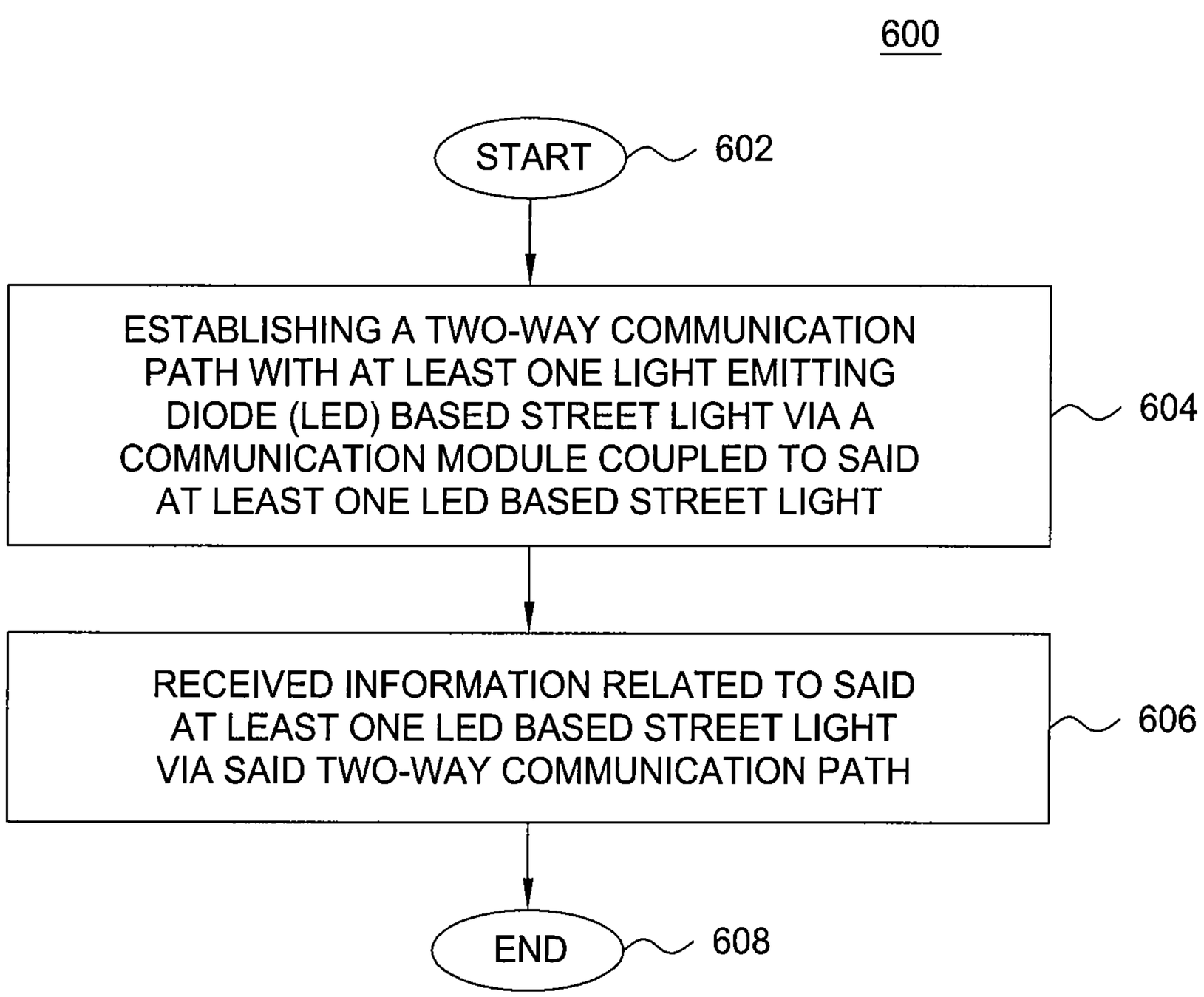
600
START
602
ESTABLISHING A TWO-WAY COMMUNICATION PATH WITH AT LEAST ONE LIGHT EMITTING DIODE (LED) BASED STREET LIGHT VIA A COMMUNICATION MODULE COUPLED TO SAID AT LEAST ONE LED BASED STREET LIGHT
604
RECEIVED INFORMATION RELATED TO SAID AT LEAST ONE LED BASED STREET LIGHT VIA SAID TWO-WAY COMMUNICATION PATH
606
END
608

FIG. 6

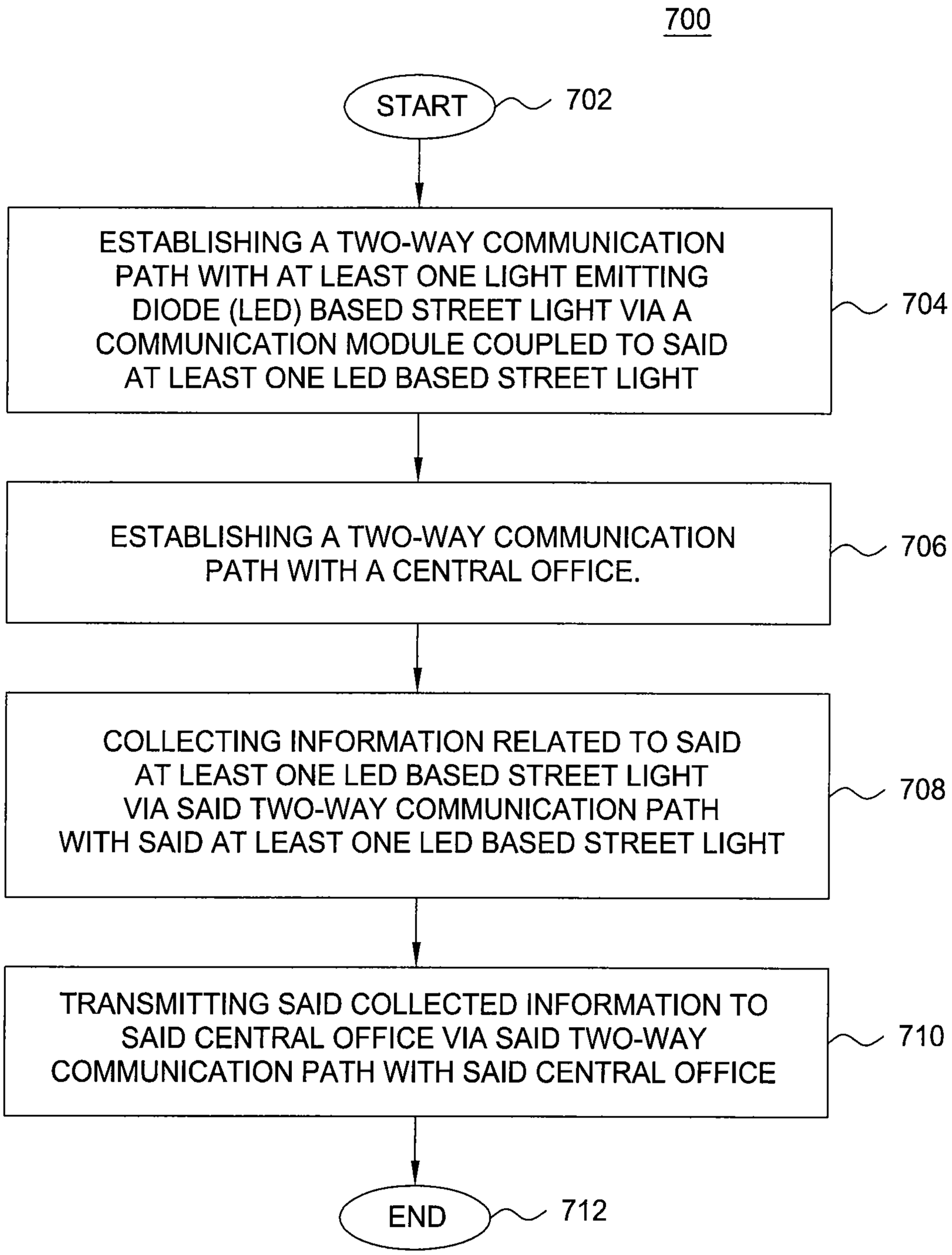
700
START
702
ESTABLISHING A TWO-WAY COMMUNICATION PATH WITH AT LEAST ONE LIGHT EMITTING DIODE (LED) BASED STREET LIGHT VIA A COMMUNICATION MODULE COUPLED TO SAID AT LEAST ONE LED BASED STREET LIGHT
704
ESTABLISHING A TWO-WAY COMMUNICATION PATH WITH A CENTRAL OFFICE.
706
COLLECTING INFORMATION RELATED TO SAID AT LEAST ONE LED BASED STREET LIGHT VIA SAID TWO-WAY COMMUNICATION PATH WITH SAID AT LEAST ONE LED BASED STREET LIGHT
708
TRANSMITTING SAID COLLECTED INFORMATION TO SAID CENTRAL OFFICE VIA SAID TWO-WAY COMMUNICATION PATH WITH SAID CENTRAL OFFICE
710
END
712

FIG. 7

REMOTE MONITORING AND CONTROL OF LED BASED STREET LIGHTS

CROSS REFERENCE TO RELATED APPLICATIONS

This application is related to PCT Provisional Patent Application Ser. No. PCT/GB2009/050437, filed on Apr. 28, 2009, entitled "METHOD AND APPARATUS FOR MULTI-ZONED ILLUMINATION", the contents of each of the above referenced applications is incorporated herein by reference.

FIELD OF THE INVENTION

The present invention is directed to remote monitoring and control of LED based street lights through a communication system employed by an advanced metering infrastructure (AMI) or an advanced meter reading (AMR).

BACKGROUND OF THE INVENTION

A street light is a raised source of light on an edge of a road which is turned on or lit at a certain time every day. The street lights may be high intensity discharge (HID) where sodium (in an excited state) in the case of a high pressure sodium (HPS) lights or a mixture of gases (by passing an electric arc through them) in the case of metal halide (MH) lights are used to produce light. Modern street lights have light-sensitive photocells to turn them on at dusk, turn them off at dawn or activate them automatically in dark weather.

Currently, street lights are inefficient and large amounts of energy are consumed to power the street lights. In addition, street lights are not monitored or controlled remotely. For example, a central office cannot monitor power consumption of street lights or diagnose a street light that fails.

SUMMARY OF THE INVENTION

The present invention is directed to a method for remotely monitoring and controlling a light emitting diode (LED) based street light. In one embodiment, the method comprises establishing a two-way communication path via a communication module to a central office, wherein said communication module is coupled to said LED based street light and sending information related to said LED based street light to said central office via said two-way communication path.

The present invention provides another embodiment of a method for remotely monitoring and controlling at least one light emitting diode (LED) based street light. The method comprises establishing a two-way communication path with said at least one LED based street light via a communication module coupled to said LED based street light and receiving information related to said at least one LED based street light via said two-way communication path.

The present invention provides another embodiment of a method for remotely monitoring and controlling at least one light emitting diode (LED) based street light. The method comprises establishing a two-way communication path with said at least one LED based street light via a communication module coupled to said at least one LED based street light, establishing a two-way communication path with a central office, collecting information related to said at least one LED based street light via said two-way communication path with said at least one LED based street light and transmitting said collected information to said central office via said two-way communication path with said central office.

BRIEF DESCRIPTION OF THE DRAWINGS

So that the manner in which the above recited features of the present invention can be understood in detail, a more particular description of the invention, may be had by reference to embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

FIG. **1** depicts one embodiment of an architecture for remote monitoring and controlling of LED based street lights;

FIG. **2** depicts one embodiment of an architecture for remote monitoring and controlling of LED based street lights using peer-to-peer communications;

FIG. **3** depicts one embodiment of an architecture for remote monitoring and controlling of LED based street lights using a local meter collector;

FIG. **4** depicts one embodiment of an architecture for remote monitoring and controlling of LED based street lights using power line modems (PLM);

FIG. **5** depicts a flow chart for one embodiment of a method for remotely monitoring and controlling the LED based street light;

FIG. **6** depicts a flow chart for another embodiment of a method for remotely monitoring and controlling the LED based street light; and

FIG. **7** depicts a flow chart for yet another embodiment of a method for remotely monitoring and controlling the LED based street light.

To facilitate understanding, identical reference numerals have been used, where possible, to designate identical elements that are common to the figures.

DETAILED DESCRIPTION

Embodiments of the present invention allow a light emitting diode (LED) based street light to be monitored and controlled remotely. For example, a central office of a utility company may monitor the LED based street lights individually or in groups of LED based street lights and also control the LED based street lights individually or in groups.

In addition, embodiments of the present invention may utilize existing infrastructures. As a result, completely new infrastructures do not need to be built to implement the present invention. Rather, the present invention allows a communication module that is compatible with an existing infrastructure to be coupled to or integrated with the LED based street lights such that the present invention is "plug and play". In other words, a utility company may take advantage of the currently used communication infrastructure to deploy the ability to monitor and control one or more LED based street lights.

One example of an existing infrastructure is an advanced metering infrastructure (AMI) used by utility companies across North America. The present invention may take advantage of the systems and communications networks already in place in the AMI. This provides a low capital investment to deploy the present invention.

FIG. **1** illustrates one embodiment of an architecture **100** for remotely monitoring and controlling at least one LED based street light. The architecture **100** includes one or more LED based street lights $\mathbf{102}_1$, $\mathbf{102}_2$ to $\mathbf{102}_n$ (herein collec-

tively referred to as LED based street lights **102** or a LED based street light **102**). Although only three LED based street lights **102** are illustrated in FIG. **1**, those skilled in the art will recognize that the architecture **100** may include any number of LED based street lights **102**.

The LED based street lights **102** may include one or more individual LEDs. In addition, one or more groups of LEDs may be organized within the LED based street lights **102**. For example, each one of the one or more groups of LEDs may be utilized to illuminate a different area and may be independently controllable.

Each one of the LED based street lights $\mathbf{102}_1$, $\mathbf{102}_2$ to $\mathbf{102}_n$ may be coupled to (e.g. in communication with) a communication module $\mathbf{104}_1$, $\mathbf{104}_2$ to $\mathbf{104}_n$, respectively (herein collectively referred to as communication modules **104** or a communication module **104**). In one embodiment, the communication module **104** may be integrated with the LED based street lights **102**. For example, the LED based street lights **102** and integrated communication module **104** may come as a single integrated unit.

The communication module **104** may be any communication module that is compatible with the communication protocols used by the architecture **100**. For example, if a paging communication protocol is used, the communication module **104** may be a Reflex Modem designed and manufactured by Dialight Corporation of South Farmingdale, N.J. However, those skilled in the art will recognize that any communication module **104** may be used.

In one embodiment, the communication module **104** may communicate via at least one of a 900 megahertz (MHz) spread spectrum band, a ZigBee protocol, a power line communication protocol, a cellular protocol, a satellite communication protocol, a paging communication protocol or any combination thereof. The communication protocol used by the communication module **104** will be dependent upon the communication protocol used by the underlying communication network.

For example, the architecture **100** may include one or more communication towers $\mathbf{106}_1$ and $\mathbf{106}_2$ and one or more gateways $\mathbf{108}_1$ and $\mathbf{108}_2$. Although only two communication towers **106** and two gateways **108** are illustrated in FIG. **1**, those skilled in the art will recognize that any number of communication towers **106** and gateways **108** may be used.

In one embodiment, the communication towers **106** and the gateways **108** may be deployed by the utility company or AMI network service provider. For example, the communication towers **106** may be wide range communication towers that use a licensed two-way communication path between the communication towers **106** and the LED based street lights **102**. The two-way communication path may use a 900 megahertz (MHz) spread spectrum protocol. Accordingly, the communication modules **104** may be a 900 MHz modem.

In another embodiment, the communication towers **106** may be a third party paging tower serviced by a telecommunications service provider. Thus, the two-way communications path may use a paging communications protocol, such as for example, ReFlex communications protocol. Accordingly, the communication module **104** may be a ReFlex modem.

The gateways **108** may communicate with a central office **112** via a public network **110**. For example, the public network **110** may be an Internet Protocol (IP) network or a Cellular network, for example Global System for Mobile communications and General Packet Radio Service (GSM/GPRS) or Cell Division Multiple Access (CDMA). Thus, a two-way communications path may be established between the central office **112** and the LED based street lights **102**.

Using the two-way communications path, the LED based street lights **102** may send information related to the LED based street lights **102** to the central office **112**. In other words, the central office **112** may remotely monitor the LED based street lights **102**. In addition, the central office **112** may send control signals to any one of the LED based street lights **102**. In other words, the central office **112** may remotely control the LED based street lights **102**. Notably, the central office **112** may remotely monitor and control individual LED based street lights **102**, one or more groups of LEDs within a single LED based street light **102** or groups of LED based street lights **102**.

The information related to the LED based street lights **102** may include report information or diagnostic information. In one embodiment, report information may include a burn time, a fault with a time-stamp, a number of ignitions, an amount of kilo-watt hours (KWH) usage, a number of functioning LEDs within the LED based street light **102**, a light output factor of the LED based street light **102** or a light degradation factor of the LED based street light **102**. In one embodiment, the diagnostic information may include a fixture malfunction or a photo controller failure.

The control signal may include a signal to turn on the LED based street light **102**, turn off the LED based street light **102**, adjust a brightness level of the LED based street light **102** or request an on demand health check of the LED based street light **102**. For example, the control signal may be used to dim the LED based street light **102** if the central office **112** determines that a street illuminated by one or more particular LED based street lights **102** is not being used (e.g. no traffic on the street).

As discussed above, the LED based street light **102** may include one or more independently controllable groups of LEDs. The control signal may include a signal to control one of the independently controllable groups of LEDs as well. For example, the control signal may only turn on one group of LEDs, while leaving off other groups of LEDs within a single LED based street light **102**.

Thus, the central office **112** may collect information related to each one of the LED based street lights **102** and control each one of the LED based street lights **102**. As a result, the central office **112** may be able to maximize the efficiency of the LED based street lights **102**, reducing energy usage and overall cost to operate the LED based street lights **102**.

FIG. **2** illustrates one embodiment of an architecture **200** for remote monitoring and controlling of LED based street lights **102** using peer-to-peer communications. The architecture **200** includes one or more LED based street lights **102**, similar in all respects to the LED based street lights **102** described with respect to FIG. **1** above.

Each one of the LED based street lights $\mathbf{102}_1$, $\mathbf{102}_2$ to $\mathbf{102}_n$ may be coupled to a communication module $\mathbf{104}_1$, $\mathbf{104}_2$ to $\mathbf{104}_n$. The communication modules **104** are similar in all respects to the communication modules **104** described above with respect to FIG. **1** above.

The architecture **200** includes a meter collector **114**, the public network **110** and the central office **112**. The public network **110** and the central office **112** are similar in all respects to the public network **110** and the central office **112** described above with respect to FIG. **1**.

Notably, in FIG. **2**, each one of the LED based street lights **102** may communicate with one another as illustrated by arrows **202**. For example, information related to the LED based street light $\mathbf{102}_1$ may be collected by the communication module $\mathbf{104}_1$ and passed on to communication module $\mathbf{104}_2$. Information related to the LED based street light $\mathbf{102}_2$ may be collected by the communication module $\mathbf{104}_2$ and

compiled with the information related to the LED based street light $\mathbf{102}_1$ and passed on to communication module $\mathbf{104}_n$ and so forth.

Eventually, all the information relating to each one of the LED based street lights **102** are forwarded to the meter collector **114**. The meter collector **114** may then forward the information over the public network **110** to the central office **112**.

Similar to FIG. **1**, the central office **112** may also send control signals over the public network **110** back to the meter collector **114**. The meter collector **114** may then forward the control signal to the appropriate LED based street light **102** using the peer-to-peer communications.

FIG. **3** illustrates one embodiment of an architecture **300** for remote monitoring and controlling of LED based street lights **102** using direct communications to a local meter collector. The architecture **300** includes one or more LED based street lights **102**, similar in all respects to the LED based street lights **102** described with respect to FIG. **1** above.

Each one of the LED based street lights $\mathbf{102}_1$, $\mathbf{102}_2$ to $\mathbf{102}_n$ may be coupled to a communication module $\mathbf{104}_1$, $\mathbf{104}_2$ to $\mathbf{104}_n$. The communication modules **104** are similar in all respects to the communication modules **104** described above with respect to FIG. **1** above.

The architecture **300** includes a meter collector **114**, the public network **110** and the central office **112**. The public network **110** and the central office **112** are similar in all respects to the public network **110** and the central office **112** described above with respect to FIG. **1**.

Notably, in FIG. **3**, each one of the LED based street lights **102** may communicate directly with the meter collector **114** as illustrated by arrows **302**. For example, information related to the LED based street light $\mathbf{102}_1$ may be communicated directly to the meter collector **114** by the communication module $\mathbf{104}_1$. Information related to the LED based street light $\mathbf{102}_2$ may be communicated directly to the meter collector **114** by the communication module $\mathbf{104}_2$ and so forth.

Eventually, all the information relating to each one of the LED based street lights **102** are forwarded to the meter collector **114**. The meter collector **114** may then forward the information over the public network **110** to the central office **112**.

Similar to FIG. **1**, the central office **112** may also send control signals over the public network **110** back to the meter collector **114**. The meter collector **114** may then forward the control signal to the appropriate LED based street light **102** using the direct communications.

In one embodiment, the peer-to-peer architecture **200** and the direct communications architecture **300** may be used to collect information locally on a street via the meter collector **114**. Then one or more meter collectors **114** may transmit the collected information over longer distances to the central office **112** via the public network **110**.

FIG. **4** illustrates one embodiment of an architecture **400** for remote monitoring and controlling of LED based street lights **102** using power line modems (PLM). The architecture **400** includes one or more LED based street lights **102**, similar in all respects to the LED based street lights **102** described with respect to FIG. **1** above.

Each one of the LED based street lights $\mathbf{102}_1$, $\mathbf{102}_2$ to $\mathbf{102}_n$ may be coupled to a communication module $\mathbf{104}_1$, $\mathbf{104}_2$ to $\mathbf{104}_n$. The communication modules **104** in FIG. **4** may comprise a PLM for wired communications.

The architecture **400** includes the gateway **108**, the public network **110** and the central office **112**. The gateway **108**, the public network **110** and the central office **112** are similar in all respects to the gateway **108**, the public network **110** and the central office **112** described above with respect to FIG. **1**.

Notably, in FIG. **4**, each one of the LED based street lights **102** may communicate with one another as illustrated by arrows **402**. For example, information related to the LED based street light $\mathbf{102}_1$ may be collected by the communication module $\mathbf{104}_1$ (e.g., a PLM) and passed on to communication module $\mathbf{104}_2$ (e.g., a PLM). Information related to the LED based street light $\mathbf{102}_2$ may be collected by the communication module $\mathbf{104}_2$ (e.g., a PLM) and compiled with the information related to the LED based street light $\mathbf{102}_1$ and passed on to communication module $\mathbf{104}_n$ (a PLM) and so forth.

Eventually, all the information relating to each one of the LED based street lights **102** are forwarded to a PLM in communications with the gateway **108**. The gateway **108** collects the information and then may forward the information over the public network **110** to the central office **112**.

Similar to FIG. **1**, the central office **112** may also send control signals over the public network **110** back to the gateway **108**. The gateway **108** may then forward the control signal to the appropriate LED based street light **102** using the PLM communications protocol.

FIG. **4** may also include a meter collector (not shown) for collecting information from utility meters coupled to homes. In one embodiment, the meter collector may also communicate with the PLMs to provide information related to the homes. Thus, the PLMs may forward utility information related to the homes along with the information related to the LED based street lights **102** to the central office **112** via the gateway **108** and the public network **110**.

FIG. **5** illustrates one embodiment of a flow chart for a method **500** for remotely monitoring and controlling the LED based street light. In one embodiment, the method **500** may be carried out by a communication module **104** coupled to a LED based street lights **102**, as described above.

The method **500** begins at step **502**. At step **504**, the method **500** establishes a two-way communication path via said communication module to a central office via a communication module coupled to the LED based street light. The communication module may be any one of the communication modules described above. For example, information from the LED based street light and control signals from the central office may be exchanged in both directions via the two-way communications path.

At step **506**, the method **500** sends information related to the LED based street light to the central office via the two-way communication path. The method **500** ends at step **508**.

FIG. **6** illustrates one embodiment of a flow chart for a method **600** for remotely monitoring and controlling the LED based street light. In one embodiment, the method **600** may be carried out by the central office **112**.

The method **600** begins at step **602**. At step **604**, the method **600** establishes a two-way communication path with at least one LED based street light via a communication module coupled to the at least one LED based street light. For example, information from the LED based street light and control signals from the central office may be exchanged in both directions via the two-way communications path. The communication module may be any one of the communication modules described above.

At step **606**, the method **600** receives information related to the at least one LED based street light via the two-way communication path. The method **600** ends at step **608**.

FIG. **7** illustrates one embodiment of a flow chart for a method **700** for remotely monitoring and controlling the LED

based street light. In one embodiment, the method **700** may be carried out by the meter collector **114** or the gateway **108**.

The method **700** begins at step **702**. At step **704**, the method **700** establishes a two-way communication path with at least one LED based street light via a communication module coupled to the at least one LED based street light. The communication module may be any one of the communication modules described above.

At step **706**, the method **700** establishes a two-way communication path with a central office. For example, the central office **112** illustrated in FIGS. **1-4**. For example, information from the LED based street light and control signals from the central office may be exchanged in both directions via the two-way communications paths.

At step **708**, the method **700** collects information related to the at least one LED based street light via the two-way communication path with the at least one LED based street light. For example, the two-way communication path may be a peer-to-peer communication, a direct communication or a communication using PLM, as illustrated above in FIGS. **1-4**.

At step **710**, the method **700** transmits the collected information to the central office via the two-way communication path with the central office. The method **700** ends at step **708**.

While various embodiments have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of a preferred embodiment should not be limited by any of the above-described embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A method for remotely monitoring and controlling a light emitting diode (LED) based street light, comprising:

establishing a two-way communication path via a communication module to a central office, wherein said communication module is coupled to said LED based street light, wherein said LED based street light comprises a plurality of independently controllable groups of LEDs;

sending by said communications module information related to said LED based street light to a meter collector, which then forwards said information to said central office via said two-way communication path, wherein said two-way communication path traverses an Advanced Metering Infrastructure (AMI); and

receiving by said communications module at least one control signal from said central office via said two-way communication path, wherein the at least one control signal turns on only one of the plurality of independently controllable groups of LEDs.

2. The method of claim **1**, wherein said at least one control signal comprises at least one of: a signal to remotely turn off said LED based street light, a signal to turn on said LED based street light, a signal to adjust a brightness of said LED based street light or a signal to request an on demand health check of said LED based street light.

3. The method of claim **1**, wherein said communication module communicates via at least one of: a 900 megahertz (MHz) spread spectrum band, a ZigBee protocol, a power line communication protocol, a cellular protocol, a satellite communication protocol, a paging communication protocol or any combination thereof.

4. The method of claim **1**, wherein said two-way communication path traverses at least one public network.

5. The method of claim **1**, wherein said information comprises at least one of: reporting information or diagnostic information.

6. The method of claim **5**, wherein said reporting information comprises at least one of: a burn time, a fault with a time-stamp, a number of ignitions, an amount of kilo-watt hours (KWH) usage, a number of functioning LEDs within said LED based street light, a light output factor of said LED based street light or a light degradation factor of said LED based street light.

7. The method of claim **5**, wherein said diagnostic information comprises at least one of: a fixture malfunction or a photo controller failure.

8. A method for remotely monitoring and controlling at least one light emitting diode (LED) based street light, comprising:

establishing a two-way communication path with said at least one LED based street light via a communication module coupled to said at least one LED based street light, wherein said at least one LED based street light comprises a plurality of independently controllable groups of LEDs;

receiving at a central office information related to said at least one LED based street light via said two-way communication path from a meter collector that received said information from said at least one LED based street light, wherein said two-way communication path traverses an Advanced Metering Infrastructure (AMI);

transmitting from a central office at least one control signal to said at least one LED based street light via said two-way communication path, wherein the at least one control signal turns on only one of the plurality of independently controllable groups of LEDs.

9. The method of claim **8**, wherein said at least one control signal comprises at least one of: a signal to remotely turn off said LED based street light, a signal to turn on said LED based street light, a signal to adjust a brightness of said LED based street light or a signal to request an on demand health check of said LED based street light.

10. The method of claim **8**, wherein said information comprises at least one of: reporting information or diagnostic information.

11. The method of claim **10**, wherein said reporting information comprises at least one of: a burn time, a fault with a time-stamp, a number of ignitions, an amount of kilo-watt hours (KWH) usage, a number of functioning LEDs within said LED based street light, a light output factor of said LED based street light or a light degradation factor of said LED based street light.

12. The method of claim **10**, wherein said diagnostic information comprises at least one of: a fixture malfunction or a photo controller failure.

13. A method for remotely monitoring and controlling at least one light emitting diode (LED) based street light, comprising:

establishing a two-way communication path with said at least one LED based street light via a communication module coupled to said at least one LED based street light, wherein said at least one LED based street light comprises a plurality of independently controllable groups of LEDs;

establishing a two-way communication path with a central office, wherein said two-way communication path traverses an Advanced Metering Infrastructure (AMI);

collecting information related to said at least one LED based street light via said two-way communication path with said at least one LED based street light;

transmitting said collected information to a meter collector, which then forwards said collected information to said central office via said two-way communication path with said central office;

transmitting from said central office said at least one control signal to said at least one LED based street light to turn on only said one of the plurality of independently controllable groups of LEDs; and

receiving by said at least one LED based street light at least one control signal from said central office, wherein the at least one control signal turns on only one of the plurality of independently controllable groups of LEDs.

14. The method of claim **13**, wherein said at least one control signal comprises at least one of: a signal to remotely turn off said LED based street light, a signal to turn on said LED based street light, a signal to adjust a brightness of said LED based street light or a signal to request an on demand health check of said LED based street light.

15. The method of claim **13**, wherein said information comprises at least one of: reporting information or diagnostic information.

16. The method of claim **15**, wherein said reporting information comprises at least one of: a burn time, a fault with a time-stamp, a number of ignitions, an amount of kilo-watt hours (KWH) usage, a number of functioning LEDs within said LED based street light, a light output factor of said LED based street light or a light degradation factor of said LED based street light.

17. The method of claim **15**, wherein said diagnostic information comprises at least one of: a fixture malfunction or a photo controller failure.

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